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10/528,333

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EXAMINER

CUTLIFF, YATE KAI RENE

ART UNIT

PAPER NUMBER

1621

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/528,333	<b>Applicant(s)</b> CONNEMANN ET AL.	
	<b>Examiner</b> YATE' K. CUTLIFF	<b>Art Unit</b> 1621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) 97 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/04/2008</u> .  | 6) <input type="checkbox"/> Other: ____.                          |

Continuation of Disposition of Claims: Claims pending in the application are 1 - 4, 9, 10, 12, 14 - 17, 20-24, 29, 30, 32, 33, 35, 36, 40, 42, 49 & 90 - 98 .

Continuation of Disposition of Claims: Claims rejected are 1 - 4, 9, 10, 12, 14 - 17, 20-24, 29, 30, 32, 33, 35, 36, 40, 42, 49, 90 -96 & 98 .

## **DETAILED ACTION**

### ***Status of Claims***

1. Claims 1 – 4, 9, 10, 12, 14 – 17, 20-24, 29, 30, 32, 33, 35, 36, 40, 42, 49 and 90 - 98 are pending.

Claims 5-8, 11, 13, 18, 19, 25-28, 32, 34, 37-39, 41, 43-48 and 50-89 have been canceled

Claim 97 has been withdrawn.

Claims 1 – 4, 9, 10, 12, 14 – 17, 20-24, 29, 30, 32, 33, 35, 36, 40, 42, 49, 90 -96 and 98 are rejected.

### ***Response to Amendment***

2. The amendment to claims 1, 2, 14, 23, 24, 40, 49 and the addition of new claims 90 - 98, submitted November 4, 2008 is acknowledged and entered.

### ***Election/Restrictions***

3. Newly submitted claim 97, an integrated combination apparatus, is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claim 1 does not avoid the prior art as set out below, as such there is no special technical feature linking the claims as to form a single general inventive concept under PCT Rule 13.1, therefore lack of unit exist a posteriori.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for

Art Unit: 1621

prosecution on the merits. Accordingly, claim 97 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

***Response to Arguments***

4. Applicant's arguments, see page 11, filed November 4, 2008, with respect to claims 1, 14, 23, 24, 40 and 49 have been fully considered and are persuasive in view of the amendments to the claim. The 35 U.S.C. 112 second paragraph rejections of claims 1, 14, 23, 24, 40 and 49 have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of 35 U.S.C. 112 second paragraph are set out below in paragraph 6.

5. Applicant's arguments with respect to claims 1 – 4, 9, 10, 12, 14 – 17, 20-24, 29, 30, 32, 33, 35, 36, 40, 42 and 49 and the rejection under 35 U.S.C. 103(a) have been fully considered but are moot in view of the new ground(s) of rejection as set out below in paragraph 12.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 3, 24, 32 and 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. Claim 3 recites the limitation "wherein the unpurified oils and fats" in line 1. There is insufficient antecedent basis for this limitation in claim 1.

Art Unit: 1621

9. Claim 24 states in lines 3 over to 4 that "the basic transesterification of the fatty acid glycerides", however, in line 2 it is stated that the esterification mixture is conducted ...". This language is inconsistent with the process steps of the claim.

10. Claim 32 recites the limitation "the heavy phase" in lines 3 over to 4. There is insufficient antecedent basis for this limitation in the claim.

11. Claim 33 recites the limitation "the heavy phase separated from the transesterification mixture" in line ; however, claim 21, depends upon claim 17 which depends on claim 16 that references "a heavy phase" from separation during esterification. Therefore, is it not clear which heavy phase is being referenced in claim 33.

### ***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Art Unit: 1621

14. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

15. Claim of 1 – 4, 9, 10, 12, 14 – 17, 20-24, 29, 30, 32, 33, 35, 36, 40, 42, 49, 90-96 and 98 are rejected under 35 U.S.C. 103(a) as being unpatentable over rejected under 35 U.S.C. 103(a) as being unpatentable over Lepper et al. (US 4,608,202), in view of Canakci et al. (American society of Agricultural Engineers 2001 ) (Canakci 1), in view of Arrowsmith (US 2,383,581), in view of Markley (Fatty Acids, Part 2, 1961 pp 759), in view of Energea-Umwelttechnologie GMBH (WO 2002038529) (Energea), in view of Canakci et al. (ASAE Paper no. 016049, 1001 ) (Canakci 2), and further in view of Metallgesellschaft AG (EP0523767) (Metall) and Jeromin et al. (US 4,698,186).

16. In the instant case, Applicant claims, inter alia, a method for the continuous production of alkyl esters of higher fatty acids from fatty acid triglyceride starting mixtures containing a free fatty acid content of 50% to 100% free fatty acids, including an integrated combination of acid esterification and basic transesterification, said method comprising: at least two esterification reaction of the free fatty acid in the starting mixture in the presence of a mono alcohol, an acid catalyst and glycerine as the

Art Unit: 1621

dragging agent to produce an esterification mixture that can be partially purified; at least two transesterification reactions of the starting mixture in the presence of a mono alcohol and a base catalyst to produce a transesterification mixture that can be purified; recovery of the dragging agent glycerine, mono alcohol and water from the esterification and transesterification reactions; and converting the acid and base catalyst from the purification process of the esterification and transesterification to a salt suitable for fertilizer. The dependent claims identify the fatty acid triglyceride starting mixture; modify the esterification step; modify the transesterification step; include a step where the esterification mixture is used in the transesterification step; limit the alcohol used in the reaction process of both esterification and transesterification; and modify the purification step.

Lepper et al. discloses a two phase process for the manufacture of fatty acid methyl esters from natural fats and oils containing free fatty acids that includes: preliminary-esterification in the presence of a monoalcohol, acid catalyst and entraining agent(dragging agent) of glycerol; phase separation into an entraining agent phase containing the acidic catalyst, water of reaction and remaining monoalcohol, and a treated oil phase; subjecting the treated oil phase to transesterification. Further, removal of the water from the entraining agent phase and recycling the dry entraining agent phase containing the acid catalyst back to a further preliminary esterification step. (see column 3 lines 57-68 & column 4, lines 1-18, 68, & column 5 line 1). In Lepper's reactions, esterification and transesterification, are conducted at temperatures between 40 and 120°C. (see Example 1). The preferred monoalcohols are C1-C4, in particular



Art Unit: 1621

methanol. (see column 4 lines 32-40). The acid catalyst use in the preliminary esterification step may be organic sulfonic acids derivatives such as, toluene sulfonic acid; or sulfuric acid. (see column 5, lines 10-22). The esterification reaction pressure is no higher than 5 bars and there is no need for a pressure reactor. (see column 4 line 50-54). The transesterification reaction is under pressureless conditions. (see column 2 lines 1-5). The transesterification reaction uses an alkaline catalyst, such as sodium methylate, and the methyl ester phase of the transesterification reaction was washed with water for purification. (see Example 1). Lastly, the amounts of the acid catalyst, as demonstrated in Examples 1 and 8, are varied in accordance with the variation of the acid number of the fatty acid in the fatty acid triglyceride mixture.

Lepper et al. fails to disclose the following: i) free fatty acid start mixtures having a free fatty acid content of 50 to 100%; ii) esterification of the free fatty acids 2-8 times; iii) carrying out transesterification at least twice; iv) use of the recovered acid and base catalyst to form a salt useful for fertilizer; v) the multitude of components used in continuous manufacturing process such as, esterification devices (consisting of a plurality of columns, transesterification devices (consisting of a plurality of columns), a rectification device and a separator; iv) drying the esterified mixture; and vi) use of the water recovered from the purification of the esterification mixture and the transesterification mixture in the purification of the transesterification mixture.

However, with regard to the range of fatty acid in the starting mixture, Lepper et al. teaches a process that is focused on producing fatty acid methyl esters from triglyceride starting materials that contain considerable quantities of fatty acid, more

Art Unit: 1621

specifically fats and oils that have an acid value over 60. (see column 2, lines 20- 23 & column 4, lines 25-31). Lepper et al, acknowledges that in the presence of alkali catalyst fats can be smoothly converted to the corresponding alkyl ester when the free fatty acid content is below 0.5% by weight, corresponding to an acid number of the triglyceride of approximately 1 and lower. (see column 1, lines 44-50).

Further, Canakci 1, also focused on oils and fats with high free fatty acids, discloses that a natural oil with 40% free fatty acid by weight could not be process with KOH by transesterification. To overcome the problem in Canakci 1 multiple esterification steps were conducted until the acid level was reduced to below 1%. (see page 1432, para. 1 column 1 over to column 2). Each of the references, Lepper et al. and Canakci 1, have as their focus a process for producing fatty acid alkyl esters from oils and fats that consist of a high level of fatty acids.

The difference is that the oils and fats of Lepper et al. and Canakci 1 do not have a fatty acid level of 100%, because this would mean that they do not have any triglyceride and would consist only of fatty acids.

In those instances where Applicant's process uses 100% free fatty acid, the process is disclosed by Arrowsmith. The process of Arrowsmith discloses that an esterification reaction where the reactants are a fatty acid and glycerine in the presence of a catalyst. (see page 1, column 2, lines 22-24). Additionally, it is known generally that esters can be formed from the reaction of an alcohol directly with an organic acid. (see Markley pp 759, para. I).

Additionally, with regard to the process having multiple esterification steps for removal of the free fatty acid, Canakci 1, teaches that two or more esterification steps can be preformed to reduce the acid level in the fatty acid triglyceride free fatty acid mixture; and a separation step between the steps to allow for removal of water formed during the reaction. (see page 1432, para. 1 column 1 over to column 2).

Furthermore, with regard to subjecting the fatty acid triglycerides, to transesterification at least twice, Canakci 2 discloses a process for producing alkyl monoesters of fatty acids from vegetable oils or animal fats, which includes a pretreatment esterification step and a transesterification step. (see abstract). The pretreatment reaction uses an acid catalyst and is conducted in two or more steps with a separation process between the pre-treatment steps to remove water formed during the reaction. (see page 3 last paragraph). The process contemplates start products having free fatty acid levels from soybean oil with low free fatty acid content to brown grease having a free fatty acid content of 40%. (see abstract). Also, it discloses that if the at the end of the transesterification step the alkyl ester product has excessive total glycerine level, a second transesterification step can be used to lower the total glycerin level in the methyl ester. (see page 9, first full paragraph).

With regard to the conversion of the acid and base catalyst from the esterification and transesterification mixture, into salts suitable for use as fertilizer, Energea discloses a process where the byproducts from the transesterification fatty acid glycerides to fatty acid methyl esters may be used as fertilizer. (see abstract & page 3, para. 7 English trans.).

Art Unit: 1621

With regard to the multitude of components multitude of components set out in the claims, such as the esterification devices (consisting of a plurality of columns, the transesterification devices (consisting of a plurality of columns), a rectification device and a separator, these features are present in the device of Metall. The device of Metall includes mixing reactors (esterification device, transesterification device), a separator, and extractor and a rectifying column. (see figure). The transesterification units used in Metall would also be suitable for carrying out esterification. Also, Canakci 2 in Figure 1 discloses a pilot plant where the esterification reaction occurs at least twice; and Figure 2 discloses a transesterification unit pilot plant. Applicant is reminded that on page 9 of Canakci 2 it is stated that transesterification may be conducted a second time.

With regards to the drying the esterified mixture, from the teaching of Lepper et al. and Canakci 2 that water produced in the esterification reaction inhibits the alkali catalyzed transesterification of the glycerides. For this reason, in Lepper, the entraining agent was used water dissolved in the entraining agent and was removed from the oil phase by distillation to remove the entraining agent. In Canakci 2, after each esterification step water is separated from the esterification product. However, neither of these references specifically state that the esterification product is dried. For this reason Examiner looked to the teaching of Jeromin et al. The process of Jeromin et al. discloses a process for reducing the free fatty acid content of fats and oil. Further, in the process of Jeromin et al. the reaction mixture, having been separated from the catalyst, is dried to remove water formed during the esterification, which would

Art Unit: 1621

adversely affect subsequent transesterification of the triglyceride. (see column 5, lines 46-51).

Lastly, with regards to use of the water recovered from the purification of the esterification mixture and the transesterification mixture in the purification of the transesterification mixture, it would be within the purview of an ordinary person skilled in the art to recover the wash water from the esterification and transesterification process at an industrial level. Thus, this step is drawn to a routine tweaking step which a skilled artisan would be motivated to do in order to make the process more efficient and cost effective.

Applicant is reminded that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference.... Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art.” In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). In the claimed process, the basic process for preparing fatty acid alkyl esters from fatty acid triglyceride mixtures containing high levels of free fatty acid is suggested by the teachings of Lepper, Canakci 1 and Canakci 2. Each of these references esterify the fatty acid triglyceride mixture having high levels of free fatty acids until the level of the free fatty acids are low enough to react in a transesterification reaction with a base catalyst to form the desired alkyl ester. Each of the references, remove the water from the esterification process by separations methods.

Art Unit: 1621

The references do not specifically teach that the free fatty acid level is 50 to 100%, however, generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In this regard the references of Canakci 1 and Canakci 2 each reduced high levels of free fatty acids in fatty acid triglyceride fatty acid mixtures by multiple esterification steps to lower the level of free fatty acid; and wherein acid levels of 40% in both Canakci references are reduced by multi-step esterification processes. Therefore, Applicant’s process of reducing the free fatty acid level by multiple esterification steps is obvious.

Each of the references removes water from the esterification product. The processes of Canakci 1 and Canakci 2 could have been modified to include the entraining agent of Lepper et al. without changing the operation of Canakci 1 or 2, because the glycerine entraining agent is a carrier for the catalyst and can be easily removed before the transesterification reaction. Jerome et al. teaching that a drying process can be used to remove water from the esterification product.

The various apparatus claimed by applicant are suggested by the teachings of Metall and Canakci 2. The apparatus are devices known in an industrial process to be suitable for the purposes set out in the claimed process, especially in an industrial type process.

Thus, it would have been obvious to one of ordinary skill in the art at the time of Applicant's claimed invention to recognize with a reasonable expectation of success by incorporating and combining together with the teachings and modifications of Lepper et al. in view of Canakci 1, in view of Canakci 2, in view of Markley, in view of Energae and further in view of Jeromin and Metall as a process for the continuous production of alkyl esters from fatty acid triglyceride mixtures having a free fatty acid content between 50 and 100%, since the various processes are all teaching continuous process that allow for the esterification of the free fatty acid in the fatty acid triglyceride mixture, then transesterification of the triglyceride and fatty acid alkyl ester as suggested by the references.

All references above teach compositions and/or methods or processes drawn to the production of fatty acid alkyl esters by a two reaction process, esterification of the free fatty acid in the fat or oil then transesterification. Lepper et al. teaches the claimed process and Canakci 1 and Canakci 2 teaches the process with the apparatus of the claimed process with the suggestion that it would be suitable for use with fat and oils that have a high free fatty acid content.

The motivation to combine the teaching of the references is suggested by Canakci 1 and Canakci 2 which each suggest continuous processes that suggest multiple steps for the esterification step and the transesterification step, as needed to produce the desired product at each step in the process. Further, the motivation can be found in the desire to make the industrial process a more efficient, economical and environmentally safe.

Therefore, the invention as a whole was *prima facie* obvious because a person of ordinary skill in the art at the time the invention was made, would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success.

***Information Disclosure Statement***

17. The information disclosure statement filed on March 18, 2005 does not fully comply with the requirements of 37 CFR 1.98(b) because: the reference for Aleks Kac does not have a date. It has been placed in the application file, and has been considered by the Examiner. However, correction is required.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YATE' K. CUTLIFF whose telephone number is (571)272-9067. The examiner can normally be reached on M-TH 8:30 a.m. - 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel M. Sullivan can be reached on (571) 272 - 0779. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Art Unit: 1621

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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